



## **SUN RIVER DRAINAGE**

### **PHYSICAL DESCRIPTION**

The Sun River is the second largest tributary of the Missouri River between Canyon Ferry and Fort Peck dams. This west-central mountain stream drains 1,979 square miles of the east slope of the Rocky Mountains. Its headwaters are within the Bob Marshall Wilderness. The upper Sun River basin is situated in steep limestone and shale mountains within the Lewis and Clark National Forest. Its upper tributaries originate at an elevation of about 8,400 feet and converge at Gibson Reservoir located in the Sun River Gorge. Downstream from Gibson Dam, the river flows for only a few miles to the Diversion Dam impoundment, which is located 17 miles northwest of Augusta. Below this dam, the Sun River exits the mountains onto the prairie zone, first through a series of glacial outwash terraces, then till-covered foothills, and, finally, through sedimentary bench lands. The mainstem of the Sun River downstream of Gibson and Diversion dams flows east 97 miles to its confluence with the Missouri River at Great Falls. The Sun River drainage lies within the bounds of Lewis and Clark, Teton, and Cascade counties. The drainage contains about 1,176 miles of perennial streams, of which about 321 are named. Major tributaries include the North and South forks, Willow, Elk, Mill Coulee and Muddy creeks. There are 17 lakes or reservoirs within the drainage, totaling 5,097 surface acres.

The reach of the Sun River between Diversion Dam and Elk Creek is 32 miles in length, and is entrenched in a very narrow valley about 100 yards wide for the first 12 miles, broadening to about 400 yards wide near the lower end of the reach. Riparian vegetation is sparse in the upper third of this reach because of the narrow floodplain. There are only scattered stands of cottonwoods and willows bordering the river with an undergrowth of rose and Russian olive. As the floodplain widens in the lower portion of this reach, deciduous woodland dominated by cottonwoods comprises the riparian zone. The stream gradient in the reach is fairly steep, averaging about 20 feet/mile. A considerable amount of the channel substrate in the upper 12 miles is composed of reefs of bedrock and large boulders. Areas of cobbles and gravel are limited and are usually associated with side drainages or near islands. Since the construction of Gibson and Diversion dams in 1929, very little bedload has entered this reach, thereby preventing development of a more diverse substrate composition. Channel substrates diversify somewhat further downstream, and are composed of boulders and cobbles.

The reach from the mouth of Elk Creek downstream to the Missouri River at Great Falls is 65 miles in length and occupies a wide valley. The riparian zone is cottonwood dominated woodland with rose and willows being the common shrub species found in the understory. The average stream gradient in this lower reach is 9 feet/mile and varies from 17 feet/mile at the upper end to less than 3 feet/mile near the city of Great Falls. The composition of the channel substrate reflects the gradual decrease in stream gradient as well as the geology. Substrate in the upper third of this reach consists mostly of cobbles and gravel with moderate amounts of silt. Further downstream, channel substrate decreases in size and the deposition of silt increases. Below the confluence of Muddy Creek, and for the remaining 17 miles, there is excessive silt deposition. Approximately 80-90% of the sediment load of the Sun River at its mouth originates from Muddy Creek caused by return flows of the Greenfield Irrigation District of BOR's Sun

River Project. The lower two-thirds of this reach is a major recharge area of return flows and surplus diverted irrigation water. Some tributary streams in the lower portion of the drainage transport these return flows and can function as valuable refuges providing cooler water habitat during critical times of the year. Prairie streams entering the drainage from the south harbor a number of native minnow species including the rare northern redbelly x finescale dace hybrid in Adobe Creek.

Land use in the forested upper basin is dominated by wilderness activities, since nearly two-thirds of the upper Sun River basin drains portions of the vast Bob Marshall and Scapegoat wilderness areas. The Forest Service lands outside the wilderness areas are managed for semi-primitive recreation and other uses including livestock grazing, and minor amounts of timber harvesting.

## **FISHERIES MANAGEMENT**

Since 1987, 15 species of fish have been sampled in the Sun River. Rainbow trout, brown trout, and mountain whitefish are generally the most commonly sampled species. Other species regularly sampled include: Rocky Mountain sculpin, longnose dace, longnose suckers, white suckers, and mountain suckers. Infrequently sampled species include: brook trout, common carp, northern pike, burbot, lake chubs, brassy minnow, brook stickleback, spottail shiner, yellow perch, walleye, black bullhead, and stonecats.

Currently, the North and South forks of the Sun River upstream of Gibson Reservoir support popular hybrid westslope cutthroat trout fisheries. Below Diversion Dam, anglers fish for rainbow and brown trout. This fishery tends to be seasonal in nature.

Early sampling events on the Sun River downstream from Diversion Dam did not allow for estimates of population size, only relative abundance through Catch per Unit Effort (CPUE). Comparisons with more recent data show changes in CPUE that are evident for mountain whitefish, rainbow trout, and brown trout in the Augusta and Simms areas. For example, a dramatic drop in CPUE has been observed for brown trout in the Simms area with numbers declining from 29.2 per electrofishing pass in 1987 to 3.4 per pass in 2005. Although the reasons for the differences are unknown, they likely are due to factors associated with irrigation water management, drought, and differences in season when the sampling occurred.

Three long-term fish population monitoring sections were established on the Sun River in 1997 in the Augusta/ U.S. Highway 287 area, the Simms area, and the reach below the town of Sun River. Due to the overall low numbers of trout, rainbow trout and brown trout data were pooled to calculate population estimates. On average, the Augusta/287 section has the highest trout densities. However, the overall trout densities are extremely low in the Sun River when compared to other trout rivers in northcentral Montana. The long-term average trout densities are 116, 43, and 90 rainbow trout and brown trout 8 inches and longer per mile in the Augusta/287, Simms, and Sun River sections, respectively. In comparison, the long-term average density of rainbow trout and brown trout combined in the Smith River are 887 and 429, 8 inches and longer per mile in the Eagle Creek and Deep Creek sections, respectively. Low trout densities are caused by year-round chronic de-watering of the Sun River Basin, resulting from large-scale irrigation withdrawals. This dewatering is especially true in the Simms section area, where the river typically ceases to flow during the summer, and is reduced to a series of disconnected

pools. Despite drought conditions, trout densities have been relatively stable—at the low levels—in all three sections through the period of record.

Nilan, Willow Creek, and Pishkun reservoirs all receive hatchery plants of rainbow trout annually to provide additional fishing opportunities. Pishkun Reservoir is also regularly stocked with kokanee salmon fingerlings. Wild recruitment provides a northern pike/yellow perch fishery in Pishkun Reservoir and a rainbow/rainbow x cutthroat trout hybrid fishery in Gibson Reservoir.

The statewide angling pressure survey for the period 1982-2009 reported that the six major waters in the Sun River drainage averaged 29,619 angler days of use annually. The mainstem Sun River averaged 7,539 angler days, the South Fork averaged 1,135 angler days, and the North Fork averaged 1,491 angler days of use for the period of record. The major reservoirs accounted for 19,454 angler days of use, with Nilan Reservoir averaging 7,832 angler days, 7,083 angler days at Willow Creek Reservoir, and Pishkun Reservoir receiving on average 4,539 angler days.

## **HABITAT**

There are approximately 365 miles of habitat capable of supporting salmonids in the Sun River drainage. Approximately 362 miles of stream support brook trout, and 461 miles support rainbow trout. Diversion Dam was constructed on top of a large barrier waterfall; upstream of this waterfall, the Sun River was historically fishless until fish stocking efforts were initiated in the early 20<sup>th</sup> century.

Long-term USGS flow records are available for the lower Sun River near Vaughn, which is 14 miles upstream from the mouth. The average annual flow for the 77-year period of record is 672 cfs. Average monthly flows ranged from 254 cfs in January to 2,500 cfs in June. Peak flows at the Vaughn gage averaged 6,754 cfs and ranged from 681-53,500 cfs for the period of Record (1934-2011). Upstream at a USGS gage at Simms, where dewatering is most severe, the mean monthly flows for August and September is 151 and 138 cfs, respectively, for the period of record (1966-2011) compared to 558 and 441 cfs, respectively, at the near Vaughn gage.

Present day flow regimens of the Sun River are largely regulated by Gibson Dam and the associated off-stream storage and irrigation delivery system of the Sun River Project, which includes Pishkun and Willow Creek Reservoirs. This system can accommodate a diversion of nearly 1,700 cfs from the river. Severe dewatering of the river below diversions has commonly occurred in the past. Irrigated agriculture is the largest consumptive use of water in the Sun River basin. Irrigated croplands include hay, alfalfa, and small grains including wheat and malting barley. Irrigation is widespread and intensive throughout the basin. Approximately 120,000 acres of land are irrigated by Sun River waters; 93,220 acres of that are by the BOR Sun River Project. The three major reservoirs in the drainage store about 159,000 acre-feet and supply water to the system throughout the growing season. It has been estimated that it would take about 450,000 acre-feet of controllable flow to meet all of the irrigation needs in the Sun River basin, assuming an overall irrigation efficiency of 40 percent and crops consuming 1.5 acre-feet per acre or a total of about 180,000 acre-feet. This volume of water is not available during many years. For example, although the long-term average for Sun River basin inflows is approximately 592,000 acre-feet, inflows only averaged about 440,000 acre-feet for the period from 2003-2007. During this time, all but 13 percent of the water in the Sun River was diverted at least once for the purpose of irrigation. Most of the 57,000 acre-feet that wasn't diverted was flow during the fall,

winter, and spring runoff that could not be captured and stored or diverted. Of the water diverted for irrigation, approximately 27 percent or about 117,000 acre-feet was consumed, or almost one acre-foot of water consumed per acre of irrigated ground.

### **FISHING ACCESS**

The Sun River is paralleled by a road for its entire course. However, public access to the 97 miles of river is basically limited to seven bridge crossings above Great Falls, three FWP fishing access sites, one BLM developed access site, a carry-in boat ramp near Wadsworth Park in Great Falls, another BLM parcel adjacent to US Highway 287, and state or federally owned parcels in the Alkali Flats area. Above Diversion Dam, the river is surrounded by US Forest Service lands and is an important recreation area with campgrounds.

### FISHERIES MANAGEMENT DIRECTION FOR THE SUN RIVER DRAINAGE

Water	Miles/acres	Species	Origin	Management Type	Management Direction
North Fork Sun River	27.1 miles	Rainbow Trout, Rb x CT hybrids	Wild	Special Regulations	Monitor populations to maintain historic population levels.
South Fork Sun River	26.4 miles	Rainbow Trout, Rb x CT hybrids	Wild	Special Regulations	Monitor populations to maintain historic population levels.
Mill Coulee Creek	7.4 miles	Rainbow trout, Brown trout	Wild	General	Maintain populations within historic levels providing for a recreational fishery and consumptive use.
Habitat needs and activities: Improve connection to the Sun River and provide passage for migratory spawning fish.					
Gibson Reservoir	1,289 acres	Arctic grayling	Wild	Conservation/ Special Regulations	Maintain population in upper reaches of the reservoir.
		Rainbow trout Rb x CT hybrids	Wild	General	Maintain populations providing for a recreational fishery and consumptive use taking into account the significant water elevation changes in the reservoir.
Sun River – Diversion Dam to mouth of Elk Creek	32 miles	Rainbow trout, Brown trout, Mountain whitefish	Wild	General	Maintain a recreational fishery and enhance population levels of all species compared to historic numbers.
		Burbot	Wild	General	Enhance population numbers.
Habitat needs and activities: Improve instream flows and irrigation water and conveyance management to improve chronic dewatering. Maintain habitat and instream flows of 100 cfs. Excellent potential to improve the fishery.					
Sun River Slope Canal	34.4 miles	Arctic grayling	Wild	Conservation	Maintain viable population in the canal.
Habitat needs and activities: Maintain overwinter habitat in upper reaches of the canal at drops to preserve population. Salvage fish at lower drops that are lost to the population and would perish if not transferred to other upstream waters.					
Sun River – Mouth of Elk Creek to confluence with Missouri River	65 miles	Rainbow trout, Brown trout, Mountain whitefish	Wild	General	Maintain a recreational fishery and enhance population levels of all species compared to historic numbers.
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Water	Miles/acres	Species	Origin	Management Type	Management Direction
		Burbot	Wild	General	Enhance population numbers.
		Stonecat	Wild	General	Maintain and enhance existing population levels.
		Northern pike	Wild	General	Maintain minimum population levels.
		Walleye	Wild	General	Manage short reach inhabited in conjunction with Missouri River.
		Native minnow species	Wild	Conservation	Safeguard species of special concern to maintain population levels.
Habitat needs and activities: Improve instream flows and irrigation water conveyance management to improve chronic dewatering and irrigation based erosion. Maintain habitat and instream flows of 130 cfs . Excellent potential to improve the fishery.					
Willow Creek	28 miles	Brook trout	Wild	General	Maintain populations within historic levels providing for a recreational fishery and consumptive use.
Habitat needs and activities: Maintain habitat and instream flows of 3 cfs.					
Ford Creek	19.3 miles	Brook trout	Wild	General	Maintain populations within historic levels providing for a recreational fishery and consumptive use.
Habitat needs and activities: Maintain habitat and instream flows of 12 cfs.					
Elk Creek	32.5 miles	Rainbow trout, Brown trout, Brook trout	Wild	General	Maintain populations within historic levels providing for a recreational fishery and consumptive use.
Habitat needs and activities: Maintain habitat and instream flows of 16 cfs. Improve water management to reduce chronic dewatering. Work to maintain passage from Sun River for adfluvial spawning migrations.					
Pishkun Reservoir	1,518 acres	Rainbow Trout	Hatchery	Put-Grow-Take	Maintain recreational fishery for consumptive harvest by continued stocking.
		Kokanee salmon	Hatchery	Put-Grow-Take/ Special Regulations	Maintain recreational fishery for consumptive harvest by continued stocking.
		Yellow perch	Wild	General	Maintain recreational fishery for consumptive harvest.
		Northern pike	Wild	General	Manage size and population by recommending manipulation of water levels during spawning.
Habitat needs and activities: Request cooperation of Irrigation District to manage water elevations to control northern pike spawning success.					

Water	Miles/acres	Species	Origin	Management Type	Management Direction
Willow Creek Reservoir	1,314 acres	Rainbow trout	Hatchery	Put-Grow-Take	Maintain recreational fishery for consumptive harvest by continued stocking.
Nilan Reservoir	521 acres	Rainbow trout	Hatchery	Put-Grow-Take	Maintain recreational fishery for consumptive harvest by continued stocking.
		Brown trout	Wild	General	Maintain recreational fishery with limited consumptive harvest.
Tunnel Lake	14 acres	Westslope cutthroat trout	Hatchery	Put-Grow-Take	Maintain recreational fishery for consumptive harvest by continued stocking.
		Arctic grayling	Transfer/ Wild	General	Maintain recreational fishery with limited consumptive harvest.
Wood Lake	20 acres	Westslope cutthroat trout	Hatchery	Put-Grow-Take	Maintain recreational fishery for consumptive harvest by continued stocking.
Westslope Cutthroat Trout Genetically Unaltered Conservation Population Streams (Isolated Single Species Populations)(2 Streams)	5.0 miles	Westslope cutthroat trout	Transfer/ Wild	Conservation	Maintain and protect populations to reduce extinction risk.
Habitat needs and activities: Maintain or improve habitat. Explore opportunities to expand existing reaches for populations. Investigate potential to establish additional pure populations above barriers and potential barrier sites.					
Westslope Cutthroat Trout Genetically Altered Streams ( 7 streams)	24 miles	Westslope cutthroat trout, Rb x WCT hybrids	Wild	Conservation	Maintain and protect populations of genetically tested 90-99% WCT.
Habitat needs and activities: Maintain or improve habitat.					



